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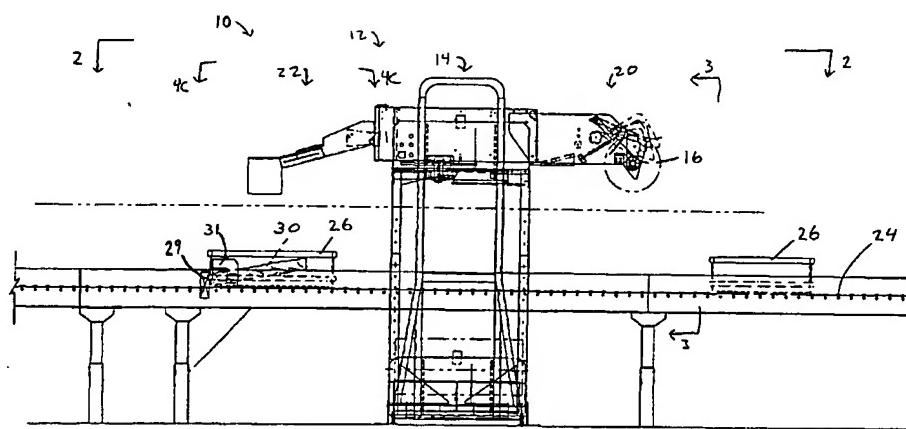
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- (54) Title: DUNNAGE CONVERSION SYSTEM AND METHOD WITH STOCK ROLL LOADER



**WO 01/96097 A2**



(57) Abstract: A dunnage conversion system (10) includes a dunnage conversion machine (12) which converts sheet stock material into a relatively lower density dunnage product useful for packing, and a stock roll loading assembly (14) which raises a roll of the sheet stock material (16) from a receiving position (18) to an elevated loading position (19) to load the stock roll onto the machine. The stock roll loading assembly has a powered elevator which lifts a stock roll and the machine also may have a stock supply assembly with a catch mechanism that engages and then captures a stock roll holder therein. A magazine provides for storage of one or more stock rolls in a vertical arrangement.

**DUNNAGE CONVERSION SYSTEM AND METHOD WITH STOCK ROLL LOADER****Related Application Data**

This application claims the benefit of U.S. Provisional Application No. 60/211,056,  
5 filed on June 13, 2000.

**Field of the Invention**

The invention described herein relates generally to a dunnage conversion system and method for producing a dunnage product from sheet stock material, and more particularly to an improved system and method for loading a roll of stock material for use  
10 by a dunnage conversion machine.

**Background of the Invention**

In the process of shipping an item from one location to another, a protective packaging material generally is placed in the shipping case, or box, to fill any voids, to cushion, to block and/or to brace the item during the shipping process. Various types of  
15 packing products have been used to pack articles in containers for shipment, including a crumpled paper dunnage product which is biodegradable, recyclable, and composed of a renewable resource, making it an environmentally responsible choice.

The conversion of sheet material into a crumpled dunnage product may be accomplished by a cushioning conversion machine, such as those disclosed in U.S. Patent  
20 Nos. 4,750,896; 4,884,999; and/or 5,607,383. (These patents are assigned to the assignee of the present application and their entire disclosures hereby are incorporated herein by reference.) Each of the cushioning conversion machines disclosed in the above-identified patents includes a conversion assembly which converts sheet stock material composed of one or more plies into a relatively less dense three-dimensional cushioning  
25 product. The conversion assembly includes a forming assembly which forms the sheet stock material into a strip of cushioning that is severed to form discrete pads useful as a packing material.

Typically, a roll of sheet stock material is rotatably supported on a stock roll holder, such as an axle or a spindle, that passes through the core of the stock roll with its ends  
30 projecting therebeyond for cradled receipt in respective laterally spaced apart mounts of a roll support member. The mounts may be provided, for example, directly on the frame of the cushioning conversion machine as shown in commonly assigned U.S. Patent No. 4,968,291. The entire disclosure of this patent is hereby incorporated herein by reference.

The stock roll typically would be loaded by positioning the stock roll on the floor or on a stand near the cushioning conversion machine. The axle or spindle would then be inserted into the center of the stock roll that then could be raised by grasping and lifting the projecting ends of the spindle for placement onto the laterally spaced apart mounts.

5 In certain packaging situations, circumstances may require the conversion machine to be placed against a wall, over a conveyor or packaging surface, or otherwise located at an elevated position. Sometimes the conversion machine is at or above head level, which makes loading a stock roll onto the machine more difficult because of the greater height which the stock roll must be lifted and/or because of restricted access to the stock roll end  
10 of the conversion machine. In such situations it may be difficult or even impossible for one person to load a stock roll on the machine. In other packaging situations large stock rolls are desired, in which case the weight of such large stock rolls makes them difficult to load. Oftentimes two people are needed to lift a stock roll and place it on the machine.  
Accordingly, it would be desirable to provide an improved system which facilitates the  
15 loading of a stock roll in those situations where conventional loading practices cannot be performed easily, if at all.

In addition, in some installations a person other than the machine operator may be designated to lift and load stock rolls onto the machine. In these situations delay may arise when such person, or attendant, is not at the machine to load a stock roll when it is  
20 needed. Consequently, the operator of the machine must wait until such person returns to the machine and such delay may be of considerable length when the attendant is busy with another task, such as loading a stock roll on another machine or machines.

Accordingly, a need exists for the storage of multiple stock rolls for loading on a conversion machine when the machine is disposed more than a few feet above the floor, is  
25 disposed above a conveyor or other structure which requires an operator to reach over the structure when loading the stock roll on the machine, and/or when an attendant other than the machine operator is used to lift and load the stock rolls onto the machine.

### Summary of the Invention

The present invention provides a dunnage conversion system and a method of its use. The dunnage conversion system includes a dunnage conversion machine which converts sheet stock material into a relatively lower density dunnage product useful for packing, and a stock roll loading assembly which raises a roll of the sheet stock material from a receiving position to an elevated loading position to load the stock material into the machine. In a preferred embodiment, the stock roll loading assembly has a powered elevator which lifts a stock roll, and the machine has a stock supply assembly with a pair of catches which engage and then capture a stock roll holder automatically. The system and method enable an operator to easily load a stock roll onto a conversion machine without having to lift the stock roll manually and/or without having to wait for an attendant to lift and load a stock roll on the machine. The machine itself has a stock supply assembly which facilitates loading a stock roll on the machine.

According to one aspect of the invention, a dunnage conversion system includes a dunnage conversion machine for converting sheet stock material into a relatively lower density dunnage product. The dunnage conversion machine has an elevated operating position. The dunnage conversion system also includes a loading assembly having a powered elevator for raising a roll of the sheet stock material to an elevated position for loading the machine.

According an embodiment of the invention, the dunnage conversion machine has a conversion assembly which converts the sheet stock material into the relatively lower density dunnage product, and a stock supply assembly supporting a roll of the sheet stock material. The dunnage conversion machine may further include a discharge guide assembly which guides dunnage products from the machine to a conveyor.

According to another aspect of the invention, a method of loading a roll of sheet stock material on a dunnage conversion machine, which converts the sheet stock material into a lower density dunnage product, includes: placing the roll of the sheet stock material on an elevator, and then controllably supplying power to the elevator for raising a roll of sheet stock material to an elevated position for loading the machine.

According to an embodiment of the invention, the method includes rotating the machine between an operating position and a loading position.

According to yet another aspect of the invention, a dunnage conversion machine for converting sheet stock material into a lower density dunnage product includes a stock supply assembly having a stock roll holder for holding a spindle which supports a roll of the

sheet stock material for rotation. The stock roll holder is movable between an operating position and a clearance position permitting passage of the stock roll spindle therewith for automatic loading.

- According to an embodiment of the invention, the stock roll holder has laterally spaced catches for supporting the spindle and the stock roll, the catches are rotatably biased to the operating position, the catches have cam surfaces which, when engaged, urge the catches away from the operating position to the clearance position, the catches have a hook portion having a U-shape for supporting the stock roll spindle in the bight of the hook portion, and/or the catches generally have an L-shape with a pivot point near one end of the L-shape and the hook portion is at the distal end of the L-shape. The stock supply assembly may also include a stop and the catches may have an abutment surface which engages the stop when biased to the operating position, and the stock supply assembly may include a brake which acts on the stock roll to inhibit rotation of the stock roll.

- According to a further aspect of the invention, a dunnage conversion machine for converting sheet stock material into a lower density dunnage product includes a stock supply assembly having a pair of laterally spaced apart catches for capturing and supporting a spindle passing through a roll of the sheet stock material. The catches are movable to a clearance position and are biased to a support position, and the catches have cam surfaces and hook portions, whereby the stock supply assembly is loadable by raising the spindle into engagement with the cam surfaces for moving the catches to the clearance position for passage of the spindle therewith, whereupon the catches return to the biased support position and the spindle is lowered to be supported in the hook portions of the catches.

- According to still another aspect of the invention, a dunnage conversion machine for converting sheet stock material into a lower density dunnage product, includes a pad discharge assembly for guiding dunnage products from an exit of the machine, wherein the length of the pad discharge assembly is adjustable.

- The foregoing and other features of the invention are hereinafter fully described and particularly pointed out in the claims. The following description and annexed drawings set forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

**Brief Description of the Drawings**

Fig. 1 is a side elevational view of a dunnage conversion system according to the present invention, including a dunnage conversion machine and a stock roll loading assembly.

5 Fig. 2 is a top view of the dunnage conversion system of Fig. 1 taken from line 2-2 of Fig. 1.

Fig. 3 is an end elevational view of the dunnage conversion system of Fig. 1 looking from line 3-3 of Fig. 1.

10 Fig. 4 is an enlarged side view of the dunnage conversion machine of Fig. 1, looking from line 4-4 of Fig. 2, showing the conversion machine in an operating position.

Fig. 4A is an enlarged side view of a stock supply assembly of the dunnage conversion machine shown in Fig. 4, looking from line 4A-4A of Fig. 2.

Fig. 4B is an enlarged side view of a pad discharge assembly of the dunnage conversion machine shown in Fig. 4, looking from line 4C-4C of Fig. 2.

15 Fig. 4C is an enlarged top view of pad discharge assembly of Fig. 4B, looking from line 4C-4C of Fig. 1.

Fig. 5 is top view of the dunnage conversion machine shown in Fig. 4, looking from the line 5-5 of Fig. 4.

20 Fig. 6 is an enlarged side elevational view of the stock roll loading assembly shown in Fig. 1.

Fig. 7 is a top view of the stock roll loading assembly shown in Fig. 6 looking from line 7-7 of Fig. 6.

Fig. 8 is an end elevational view of the dunnage conversion system of Fig. 1 showing the conversion machine in a loading position.

25 **Detailed Description**

An exemplary dunnage conversion system 10 according to the present invention is shown in Figs. 1-3. The system 10 includes a dunnage conversion machine 12 which converts sheet stock material into a relatively less dense cushioning dunnage product and a stock roll loading assembly 14 which raises a roll 16 of the sheet stock material from a 30 receiving position 18 (Fig. 3) to an elevated loading position 19 (Fig. 8) to load the roll onto the dunnage conversion machine.

The sheet stock material generally consists of multiple superimposed webs or plies of kraft paper of any desired basis weight. In one embodiment, an about thirty-inch (about 76 cm) wide roll of thirty-pound paper, which is approximately four hundred and fifty feet

(about 137m) long, will weigh about thirty-five pounds (about 16 kg) and will provide cushioning dunnage equal to approximately four fifteen cubic foot (about 1.7 cubic meters) bags of plastic foam peanuts while at the same time requiring less than one-thirtieth the storage space. The stock material also may be supplied in larger rolls weighing, for 5 example, up to about 105 pounds (about 48 kg) making them more difficult to load. Larger or smaller stock rolls also may be used in some situations, as well as stock rolls of different types and weights of material and/or different numbers of plies.

The stock roll 16 generally has a three inch (about 7.5 cm) cardboard tube around which multiple plies of the sheet material are tightly wrapped. A disposable plastic plug 10 may be inserted into each end of the core tube to accommodate a difference between the inner diameter of the tube and the outer diameter of a stock roll holder, such as an axle or a spindle 44, used to support the stock roll on the conversion machine. Alternatively, the holder may incorporate plug portions thereon with the holder formed in two sections such that the sections can be inserted from opposite ends of the tube. For further information 15 about these and other types of stock roll holders, U.S. Patent No. 5,749,539 is commonly owned by the assignee of the present invention and the entire disclosure therein is incorporated herein by reference.

Any type of dunnage conversion machine which converts the sheet stock material into a lower density dunnage product, such as a void fill, or a cushioning material, may be 20 used in accordance with the invention. In the illustrated embodiment the conversion machine 12 is a cushioning conversion machine mounted at an elevated position in a substantially horizontal orientation. In other words, an imaginary line from an upstream end 20 of the machine to a downstream end 22 of the machine, corresponding to the direction of passage of the sheet material through the machine, would be substantially 25 horizontal.

The illustrated machine 12 is mounted above and straddles a conveyor 24 with the direction of passage of the sheet material through the machine lying substantially parallel to the longitudinal extent of the conveyor. The conveyor transports totes, bins or other containers 26 which receive dunnage products 30 from the dunnage conversion machine 30 and transport them to a remote location for packing. The system may deposit multiple dunnage pads into the tote from the conversion machine 12, and/or may include multiple dunnage conversion machines along the conveyor to deposit pads above and below a product placed in the tote for packing at the remote location. The conveyor also may include a tote sensor 31 near a downstream end of the machine, such as an optical

sensor, to sense the presence of a tote positioned to receive one or more dunnage products. A tote stop 29 also is provided to stop a tote on the conveyor, at a specific location, to receive the dunnage product.

The system 10 further includes one or more controllers (not shown) to control the 5 operation of the conversion machine 12, the loading assembly 14 and/or the conveyor 24. For example, a signal from the tote sensor 31 indicating the presence of a tote 26 may cause the controller to instruct the machine to produce a dunnage product 30 of a specific length and cause it to be deposited in the tote.

As shown in Figs. 4 through 5, the machine 12 generally includes a stock supply 10 assembly 32 at the upstream end 20 of the machine that supplies the sheet stock material to the machine. A conversion assembly (not shown), of any defined type, is enclosed in a housing 34 downstream of the stock supply assembly and converts the sheet stock material into a less dense dunnage product or pad. A pad discharge assembly 36 located at a downstream end of the machine directs the pads 30 to the awaiting tote 26 for use as 15 dunnage products.

In the illustrated conversion machine 12, the stock supply assembly 32 includes two laterally spaced bracket walls 40 which support a capture device 42 at distal upstream ends of the walls to support and capture the ends of a stock roll spindle 44 supporting the stock roll 16, a constant-entry device 46 downstream of the capture device, and a 20 separating device 50 downstream of the constant-entry device. The constant-entry device and the separating device may be omitted in some dunnage conversion machines.

The capture device 42 includes a pair of latches or catches 52 (shown in multiple superimposed positions) laterally spaced to support and capture respective ends of the stock roll spindle 44. The catches are biased by a spring 54 to a support position against 25 catch stops 56 mounted to the bracket walls 40, although the catches could be otherwise biased to the support position, such as by gravity. Each catch swings about a pivot point 60 and generally has an L-shape, one leg 62 extending radially outwardly from the pivot point and the other or outer leg 64 angling downwardly. The distal end of the outer leg 64 extends back on itself to form a hook portion 65 for catching and for rotatably supporting 30 an end of the stock roll spindle therein. The outer surface of the hook portion has an abutment portion 67 which engages stop 56 and a cam surface 69 on the abutment portion. The cam surface 69 is positioned to be engaged by the stock roll spindle as the same is raised by the stock roll loading assembly 14.

During the stock roll loading process, the dunnage conversion machine is rotated clockwise ninety degrees as will be further explained hereafter, from the position shown in Fig. 2, for example, to a position wherein the upstream end 20 of the machine 12 is aligned with loading assembly 14, as shown in Fig. 8. During loading, as the stock roll 5 loading assembly 14 raises the stock roll 16, the stock roll spindle 44 engages the cam surface 69 and progressively urges the catches 52 to swing about the pivot points 60 to provide clearance for the spindle to pass the distal ends of the hook portions 65, each catch 52 functioning as a pawl. Once the spindle 44 travels past the hook portions, the catches return to the biased support position against the catch stops 56 and the spindle is 10 lowered whereupon the ends of the spindle are captured in the bight of the hook portions with the spindle rotatably supported therein.

The stock supply assembly 32 generally also includes a brake mechanism 66 to prevent or minimize stock roll overrun. The problem of overrun results from the rotational momentum of the stock roll 16 causing the stock roll to continue rotating after the stock 15 material is no longer being fed into the machine 12. This becomes a problem when the machine resumes the feeding of the stock material: as the slack is taken up, the tension in the stock material increases sharply and can lead to tearing in the stock material. The brake minimizes this problem by providing a frictional drag on the stock roll.

In the illustrated embodiment the brake mechanism 66 includes an axle 70 20 rotatably mounted between the bracket walls 40 and extending substantially parallel to the stock roll spindle 44, a brake snubber or lever 72 (shown in multiple superimposed positions) extending from the axle to engage or to snub up against an outer surface of the stock roll 16, a crank 74 (also shown in multiple positions) attached to an end of the axle, and a spring 76 connected between one of the bracket walls 40 and a distal end of the 25 brake lever 72 to bias the brake lever against the stock roll 16. For a large diameter stock roll, the spring is stretched to apply a larger force through the brake lever to the surface of the stock roll 16. This is advantageous as the larger diameter stock rolls have a larger mass and thus a larger rotational momentum against which to brake. As the diameter of the stock roll decreases with the dispensation of sheet material from the roll, the brake 30 lever remains biased against the surface of the stock roll, however, the force applied against the stock roll decreases with the reduced length of the spring. A larger force is not needed for the reduced mass of the stock roll as it nears depletion and thus has reduced rotational momentum. However, other stock roll brake mechanisms may be used in accordance with the invention.

Stock material payed off the stock roll 16 passes over the constant-entry device or roller 46. The constant-entry device provides a non-varying point of entry for the sheet material from the stock roll into the separating device 50 and the conversion assembly regardless of the diameter of the stock roll. Thus when a different diameter roll is used

5 and/or as the stock roll dispenses stock material and decreases in diameter, the point of entry of the stock material into the separating device remains constant. This consistency is believed to facilitate the production of a uniform dunnage product. From the constant-entry device, the multi-ply sheet stock material passes to the separating device.

The separating device 50 separates the plies of paper prior to their passing to the

10 conversion assembly and includes a plurality of separating members. The number of separating members, shown as three in the drawings -- an upper member 80, an intermediate member 82, and a lower member 84 -- generally corresponds to the number of plies or webs of stock material. For further information about these and other types of constant-entry devices and/or separating devices, U.S. Application No. 09/229,459 filed on

15 January 12, 1999 is hereby incorporated by reference in its entirety. This application is commonly owned by the assignee of the present invention.

The conversion machine 12 generally may use any type of conversion assembly for converting the sheet stock material into a lower density dunnage product. Several exemplary cushioning conversion machines and conversion assemblies are disclosed in

20 the aforementioned commonly owned and previously incorporated references, including U.S. Patent Nos. 4,750,896; 4,884,999; and/or 5,607,383.

As best shown in Figs. 4B and 4C, the pad discharge assembly 36 is mounted to the downstream end 22 of the machine 12 to direct dunnage products 30 to the awaiting tote 26 on the conveyor 24 for use as a dunnage pad. The pad discharge assembly is in

25 the form of a sloped chute formed by a bottom slide member 85 and side wall members 86 connected to lateral sides of the bottom slide member to laterally guide the dunnage product as it is caused by gravity to slide down the bottom slide member of the chute. The chute also has a chute extension 87 slidably and adjustably connected to the downstream end of the chute to further guide the dunnage product. The chute extension

30 has a bottom slide extension 88 and lateral side wall extensions 89 connected to lateral sides of the bottom slide extension.

In operation, an initial dunnage pad is held by the machine 12, the chute 36 and/or a selected surface friction of the bottom slide member 85 until a succeeding pad pushes the initial dunnage pad down the chute, the pad continuing down and off the chute under

the influence of gravity. The downstream-most edge of the bottom slide member 85 or the bottom slide extension 88 forms a pivot line 90 about which the dunnage pad pivots as it is caused by gravity to slide down chute to fall toward the tote 26 on the conveyor 24. The side wall extensions 89 have further directing portions in the form of laterally spaced apart vertical walls 91 (with no bottom surface between the vertical walls), extending beyond and below the end of the bottom slide extension 88. The vertical walls serve as restraining walls that cause the pad to fall in a predetermined trajectory (relative to the tote) by inhibiting any tendency in the pad 30 to skew to the lateral left or right sides of the tote (above or below the tote illustrated in Fig. 4C).

- 10 Since the dunnage pad 30 generally has a relatively uniform density, when more than half the pad extends beyond the pivot line 90, the pad will pivot about the pivot line and fall into the tote 26 that is positioned therebelow on the conveyor 24. For example, a twenty inch (about 50 cm) pad should pivot just past its midline of ten inches (about 25 cm). The sloping length of the chute should be at least ten inches (about 25 cm).
- 15 Similarly, if the pad has a thirty inch (about 76 cm) length, the chute extension 87 should be adjusted so that the pivot point is about fifteen inches (about 38 cm) from an exit of the machine 12 so that the dunnage pad falls into the tote on the conveyor for packing at a remote location.

- As best seen in Figs. 4B and 4C, instead of changing the loading position of the tote 26 on the conveyor 24 (as defined by tote stop 29) when different length dunnage pads are desired to be deposited into the tote 26, the position of pivot line 90 is changed by a distance of one-half of the change of the pad length. For example, assume the chute extension 87 is adjusted relative to slide member 85 such that a twenty inch (about 50 cm) long pad 30 will pivot at pivot line 90 and have a trajectory so that its leading edge 25 will land substantially adjacent to an inside front edge of the tote 26 as illustrated in Fig. 4C. If it is now desired that a thirty inch (about 76 cm) long pad should have a trajectory

appropriate scale can be added to bottom slide member 85 or side wall members 86 so that the machine operator can easily make the necessary adjustment of the position of the pivot line 90. Furthermore, automatic adjustment can be achieved via motorized pivot line adjustment, for example via a solenoid (not shown) integrated with the machine pad length control.

Returning to Figs. 4 and 5, the machine 12 is mounted to means for rotating same, such as a turntable 92, to rotate the machine and the stock supply assembly 32 to a position more convenient for loading a stock roll thereon, such as a position in which the stock roll assembly 32 is not located over the conveyor 24. As best seen in Fig. 4, 10 the machine is mounted on a stand 93 at an elevated position above the conveyor. The stand has four vertically adjustable legs 94 (as shown in Figs. 2 and 4) which adjustably support the machine at any of a plurality of elevated positions. The turntable 92 allows the machine to be rotated from an operating position (as shown in Fig. 1), wherein the stock supply assembly 32 is aligned with and is located over the conveyor, to a loading 15 position (Fig. 8) wherein the stock supply assembly is aligned with and is positioned to accept a stock roll 16 from the stock roll loading assembly 14.

As best seen in Figs. 4 and 5, the turntable 92 includes a base plate 96 mounted to the stand 93, a mounting plate 100 attached to the machine 12 and is rotatably connected to the base plate. A plurality of bearings 102 is mounted between the base 20 plate and the mounting plate to support the machine and facilitate its rotation between the operating position and the loading position. The turntable also has a locking pin 104 for locking the turntable in the desired position. A lever arm 106, extending outwardly from a central portion of the turntable, forms part of a linkage for engaging and releasing the locking pin 104.

25 Although in the illustrated embodiment the dunnage conversion machine is rotated about a vertical axis, the means for moving the machine may include a carriage mounted to the machine for movement along a set of tracks, a mounting assembly such as is shown in commonly owned U.S. Patent No. 5,730,696 which is hereby incorporated in its entirety, or other devices for moving, rotating or pivoting the machine between the 30 operating position and the loading position which may or may not provide different orientations of the machine. In addition, in accordance with the present invention the machine may be used exclusively without means for moving the machine. In such an installation the operating position and the loading position are the same.

Turning to Figs. 1-3 generally and Figs. 6-8 more specifically, the stock loading assembly 14 is positioned such that when the dunnage conversion machine 12 is in the loading position (Fig. 8), the stock loading assembly is located below the stock supply assembly 32 of the machine 12. The stock loading assembly includes a magazine 110, 5 and an elevator 112 which raises a stock roll 16 from the stock roll receiving position 18 to an elevated loading position 19 to load the stock roll onto the machine. The magazine includes a frame 114 formed of vertical members 116 and interconnecting cross members 118. The elevator includes a holder in the form of a cradle 120 which supports a stock roll, and a lift 122 which raises the cradle to the elevated loading position. The lift 10 may be any type of device which can raise the cradle to an elevated position, such as a hydraulic lift or a chain drive lift. An exemplary commercial lift or stacker is a Presto-brand EL-766 stacker, available from Lee Engineering of Carrollton, Texas.

The illustrated cradle 120 has upper walls which form a V-shape trough. The walls of the trough may have reduced-friction surfaces or bearings which facilitate axially 15 loading a stock roll 16 into the trough, such that the stock roll can be moved axially into the cradle from a stock roll transport (not shown), for example. The stock roll spindle 44 can be inserted in the stock roll either before or after the stock roll is loaded into the cradle.

The stock roll assembly 32 may be utilized to load single stock rolls 16, or with 20 magazine 110 for retaining an array of vertically arranged stock rolls 16. In the latter arrangement, magazine 110 includes one-way latches 124 at one or more elevated positions that allow the ends of the spindle 44 to pass, but prohibit return movement, as the elevator raises the stock roll past the latches 124 and then returns to the stock roll receiving position 18. The stock loading assembly 14 may also include a sensor 126, 25 which senses a stock roll at the elevated loading position 19, for elevator control purposes.

The lift 122 can either transport the cradle 120 and the stock roll 16 from the stock roll receiving position 18 to the elevated loading position 19 for loading the stock roll onto the machine 12, or if a storage magazine 110 is utilized, the lift can return the cradle to 30 the stock roll receiving position, leaving the stock roll supported at an intermediate elevated position 125 by the one-way latches 124 of the magazine 110. At the intermediate storage position, the stored stock roll is held at sufficient elevation that a further stock roll can be loaded onto the cradle without interference from the stored stock roll. The further stock roll then is raised on the cradle, thereby also raising the stored

- stock roll which is supported from below by the further stock roll. Thus, a plurality of stock rolls can be stored in the magazine for sequential use. As the cradle is raised by the lift, the cradle will support the stack of already stored stock rolls such that the top-most stock roll ultimately is loaded onto the machine. The sensor 126 serves an
- 5 important function in the case of multiple stored stock rolls since the lift does not raise the cradle 120 all the way to the loading position 19, but only a distance sufficient to load the top-most stock roll.

As seen in Figs. 6 and 7, opposite sides of the magazine 110 each is provided with vertical plates 127 which have inner vertical edges spaced apart to form a vertical 10 guide channel 129 for the ends of the spindles 44 as the spindles are raised with the stock rolls during loading of the magazine and/or conversion machine. As illustrated, the guide channel 129 maintains the stock rolls vertically aligned in the magazine when no longer supported in the cradle 120.

In summary, a stock roll 16 is loaded onto the cradle 120 at the stock roll receiving 15 position 18 and the spindle 44 is inserted into the stock roll. When the dunnage conversion machine 12 is without stock material, the lever arm 106 is engaged to release the locking pin 104 on the turntable 92, the machine 12 is moved or rotated to the loading position and the depleted spindle (if any) is removed from the catches 52. The elevator 112 transports the cradle and the stock roll past the one-way latches 124 (if a storage 20 magazine 110 is utilized) to the loading position 19. As the stock roll moves to the loading position, the lateral ends of the spindle contact the cam surfaces 69 of the stock roll catches 52. As the cradle continues to elevate the stock roll, the spindle ratchets past the cam surfaces and the catches return to the operating position and abut the stops 56. About this time the sensor 126 will detect the stock roll spindle 44 having traveled past 25 the catches and the elevator returns to the stock roll receiving position, depositing the stock roll spindle in the bight of the hook portions of the catches as it moves down. The stock material can be fed into the machine, and the machine can be returned to the operating position, and locked in position.

Instead of elevating the stock roll 16 all the way to the loading position, the lift 122 30 can return to the stock roll receiving position after the stock roll spindle 44 passes the one-way latches 124 when the storage magazine 110 is utilized. A further stock roll 16 then can be loaded onto the cradle 120 and raised, thereby also lifting the first stock roll. When the machine 12 needs a new supply of stock material, the lever arm 106 can be engaged to release the locking pin 104, and the machine rotated from the operating

position to the loading position. The lift can then raise the cradle, perhaps holding a yet another stock roll, thereby raising the already stored stock rolls as well. The stock roll spindle 44 of the top or initial stock roll will then engage the cam surfaces 69 of the catches 52, and ratchet past the cam surfaces until the sensor 126 detects the presence 5 of the stock roll spindle as the catches pivot about pivot points 60. The lift will then return to the stock roll receiving position 18, after depositing the top stock roll spindle in the hook portions of the catches for use by the dunnage conversion machine. The storage of multiple stock rolls in the storage magazine 110, if utilized, will reduce or eliminate delays in the packing process since the operator of the machine will not have to retrieve a stock 10 roll from a remote location before loading a stock roll onto the machine. The system and method of the present invention thus provide improvements in the way stock rolls are loaded onto a dunnage conversion machine, or onto a machine mounted in a elevated location that is difficult to access.

Although the invention has been shown and described with respect to a certain 15 illustrated embodiment, equivalent alterations and modifications will occur to others skilled in the art upon reading and understanding the specification and the annexed drawings. In particular regard to the various functions performed by the above described integers (components, assemblies, devices, compositions, etc.), the terms (including a reference to a "means") used to describe such integers are intended to correspond, 20 unless otherwise indicated, to any integer which performs the specified function (i.e., that is functionally equivalent), even though not structurally equivalent to the disclosed structure which performs the function in the herein illustrated embodiments of the invention. In addition, while a particular feature of the invention may have been described above with respect to only one of several illustrated embodiments, such a feature may be 25 combined with one or more other features of the other embodiment, as maybe desired and advantageous for any given or particular application.

What is claimed is:

1. A dunnage conversion system, comprising a dunnage conversion machine (12) for converting sheet stock material into a relatively lower density dunnage product, the dunnage conversion machine having an elevated operating position; and a loading assembly (14) including a powered elevator (112) for raising a roll of the sheet stock material to an elevated position for loading the machine.
2. The system of claim 1, wherein the dunnage conversion machine has a stock supply assembly (32) for supporting a roll of the sheet stock material.
3. The system of claim 1 or claim 2, wherein the elevator includes a cradle (120) for supporting the stock roll.
4. The system of claim 3, wherein the cradle has reduced-friction surfaces which facilitate axially loading a stock roll into the cradle.
5. The system of any preceding claim, wherein the loading assembly includes a controller for controlling the operation of the elevator.
- 15 6. The system of any preceding claim, wherein the loading assembly includes a magazine (110) having at least one one-way latch (124) at one or more elevated positions that allow a stock roll spindle to pass thereby in only one direction.
7. The system of any preceding claim, wherein the loading assembly includes a magazine for holding a plurality of stock rolls.
- 20 8. The system of any preceding claim, wherein the loading assembly includes a sensor (126) for detecting a stock roll at the loading position.
9. The system of any preceding claim, wherein the dunnage conversion machine has a stock supply assembly (32) for supporting a roll of the sheet stock material, and the stock supply assembly has laterally spaced catches (52) for supporting a stock roll spindle.
- 25 10. The system of claim 9, wherein the catches (52) are rotatably biased to an operating position.
11. The system of claim 10, wherein the catches (52) have cam surfaces (69) which, when engaged, urge the catches away from the operating position.
- 30 12. The system of any preceding claim, wherein the dunnage conversion machine is movable between an operating position for converting the sheet stock material from the stock roll and a loading position for loading a new stock roll on the stock supply assembly.

13. The system of any preceding claim, wherein the dunnage conversion machine further includes a discharge guide assembly (36) which guides dunnage products from the machine to a conveyor, and the length of the pad discharge assembly is adjustable.

5 14. The system of claim 13, wherein the discharge guide assembly includes a chute having a sloped bottom surface and lateral sides which guide dunnage products exiting the machine, and the end of the sloped bottom surface forms a pivot line (90) about which the dunnage products pivot to fall off the discharge guide assembly (36).

10 15. The system of claim 14, wherein the chute is formed in two sections which are slidably adjustable relative to each other to change the distance from an exit of the machine to the pivot line.

15 16. The system of claim 14 or claim 15, wherein the lateral sides of the chute extend beyond and below the pivot line to form laterally spaced apart vertical walls (91) which guide the dunnage products as and after the dunnage products fall off the end of the chute.

17. A method of loading a roll of sheet stock material (16) on a dunnage conversion machine (12) which converts the sheet stock material into a lower density dunnage product, comprising:

- 20 a) placing the roll of the sheet stock material on an elevator (112), and  
b) controllably supplying power to the elevator for raising the roll of sheet stock material to an elevated position for loading the machine.

18. The method of claim 17, wherein the stock roll into a cradle (120) and the cradle is elevated to raise the stock roll.

19. The method of claim 17 or claim 18, further comprising inserting a spindle 25 into the stock roll, and engaging cam surfaces (69) on catches (52) on the dunnage conversion machine with the spindle as the stock roll is being raised to urge the catches out of the way for passage of the spindle thereby, and allowing the catches to move beneath the spindle after the spindle has passed thereby, and then lowering the stock roll until the spindle is supported in hook portions (65) of the catches.

30 20. The method of any one of claims 17-19, further comprising rotating the machine between an operating position and a loading position.

21. The method of any one of claims 17-20, wherein the elevating step includes elevating the stock roll past at least one one-way latch (124) at an elevated position.

22. The method of any one of claims 17-21, further comprising sequentially loading a plurality of stock rolls into a magazine (110).
23. The method of any one of claims 17-22, wherein there is used sheet stock material that is biodegradable, recyclable and composed of a renewable resource.
- 5 24. The method of claim 23, wherein the sheet stock material is kraft paper.
25. A dunnage conversion machine (12) for converting sheet stock material into a lower density dunnage product, comprising a stock supply assembly (32) having a stock roll holder for holding a spindle which supports a roll of the sheet stock material for rotation, the stock roll holder being movable between an operating position and a
- 10 clearance position permitting passage of the stock roll spindle thereby for automatic loading.
26. The machine of claim 25, wherein the stock roll holder has laterally spaced catches (52) for supporting the spindle and the stock roll.
- 15 27. The machine of claim 25 or 26, wherein the catches (52) have cam surfaces (69) which, when engaged, urge the catches away from the operating position to the clearance position.
28. A dunnage conversion machine (12) for converting sheet stock material into a lower density dunnage product, comprising a pad discharge assembly (36) for guiding dunnage products from an exit of the machine, wherein the length of the pad discharge assembly is adjustable.

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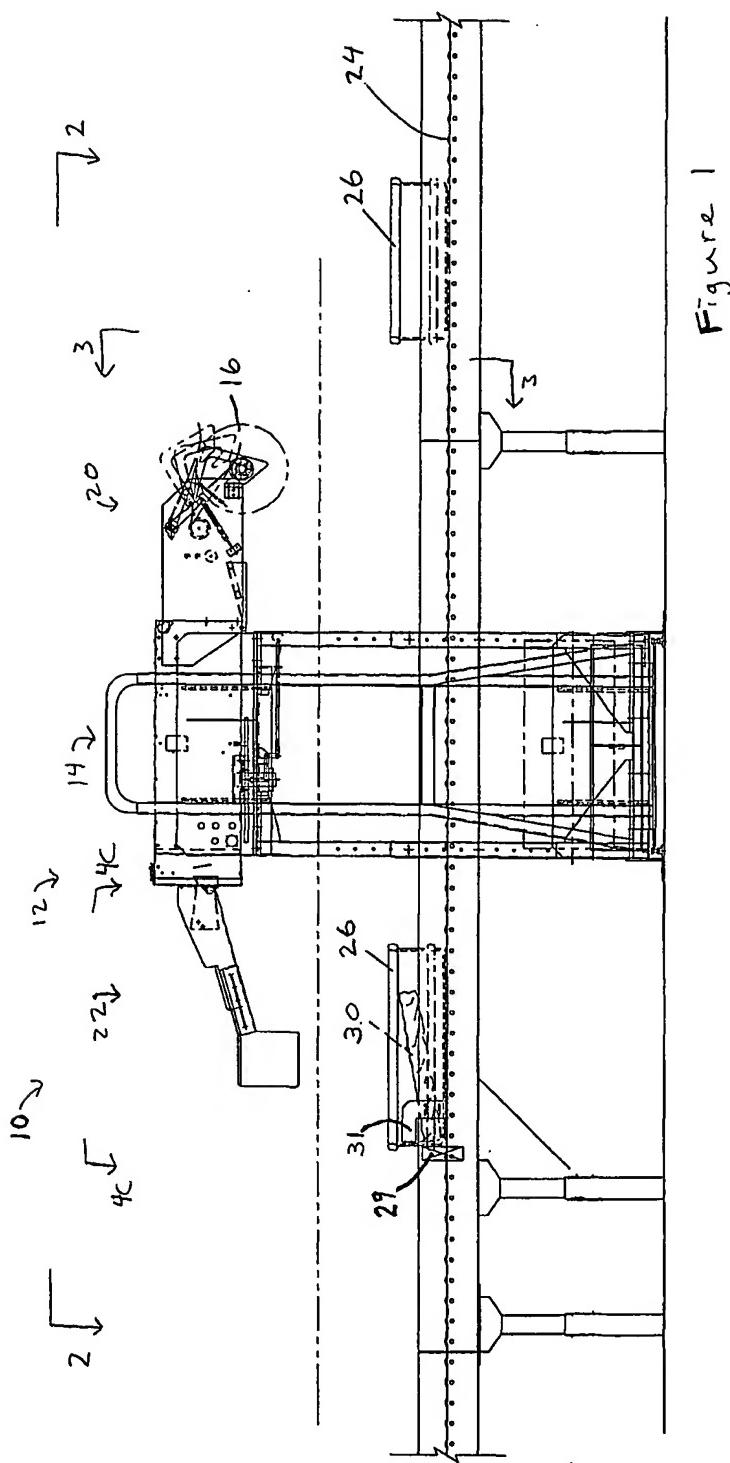


Figure 1

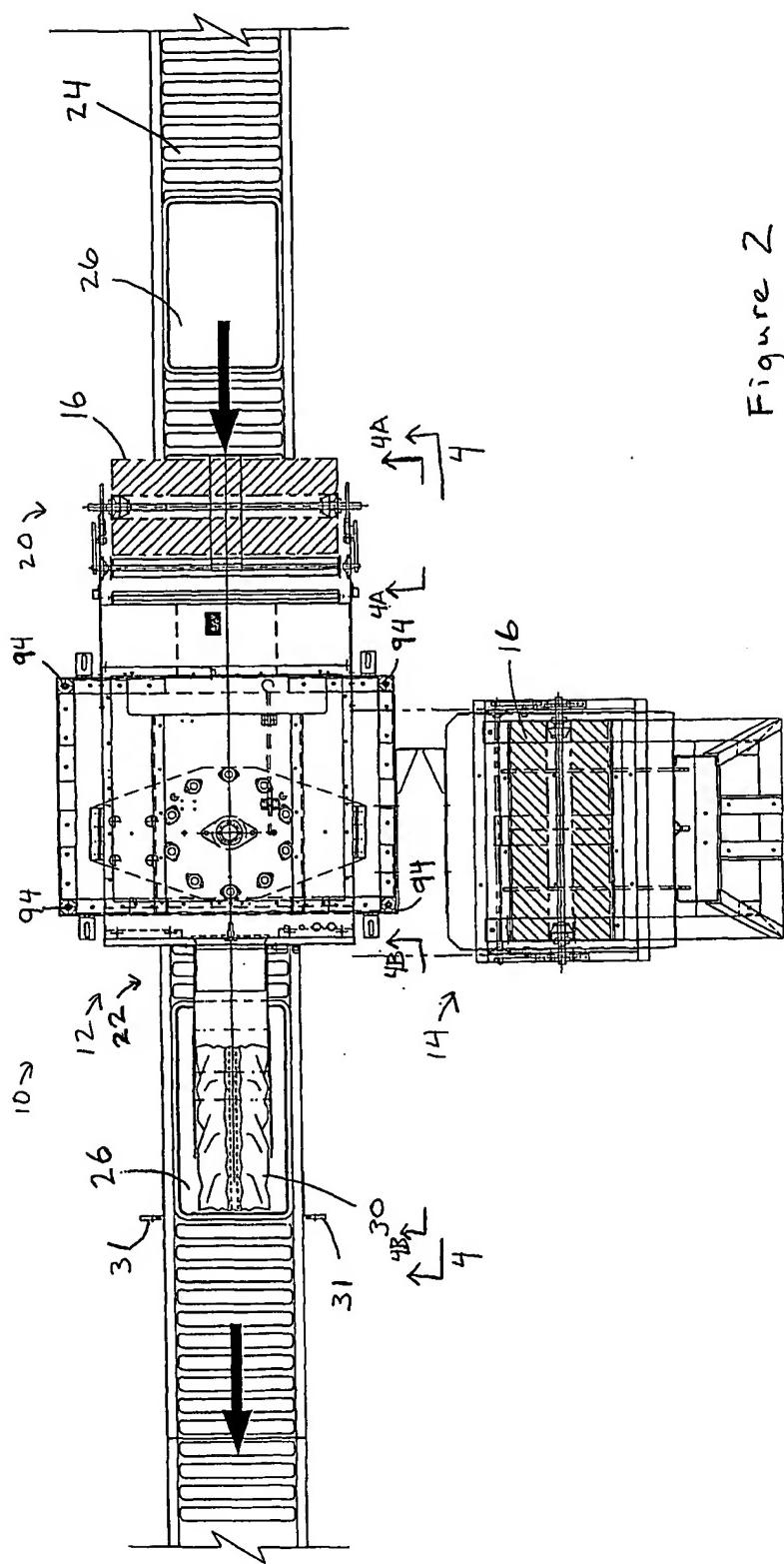
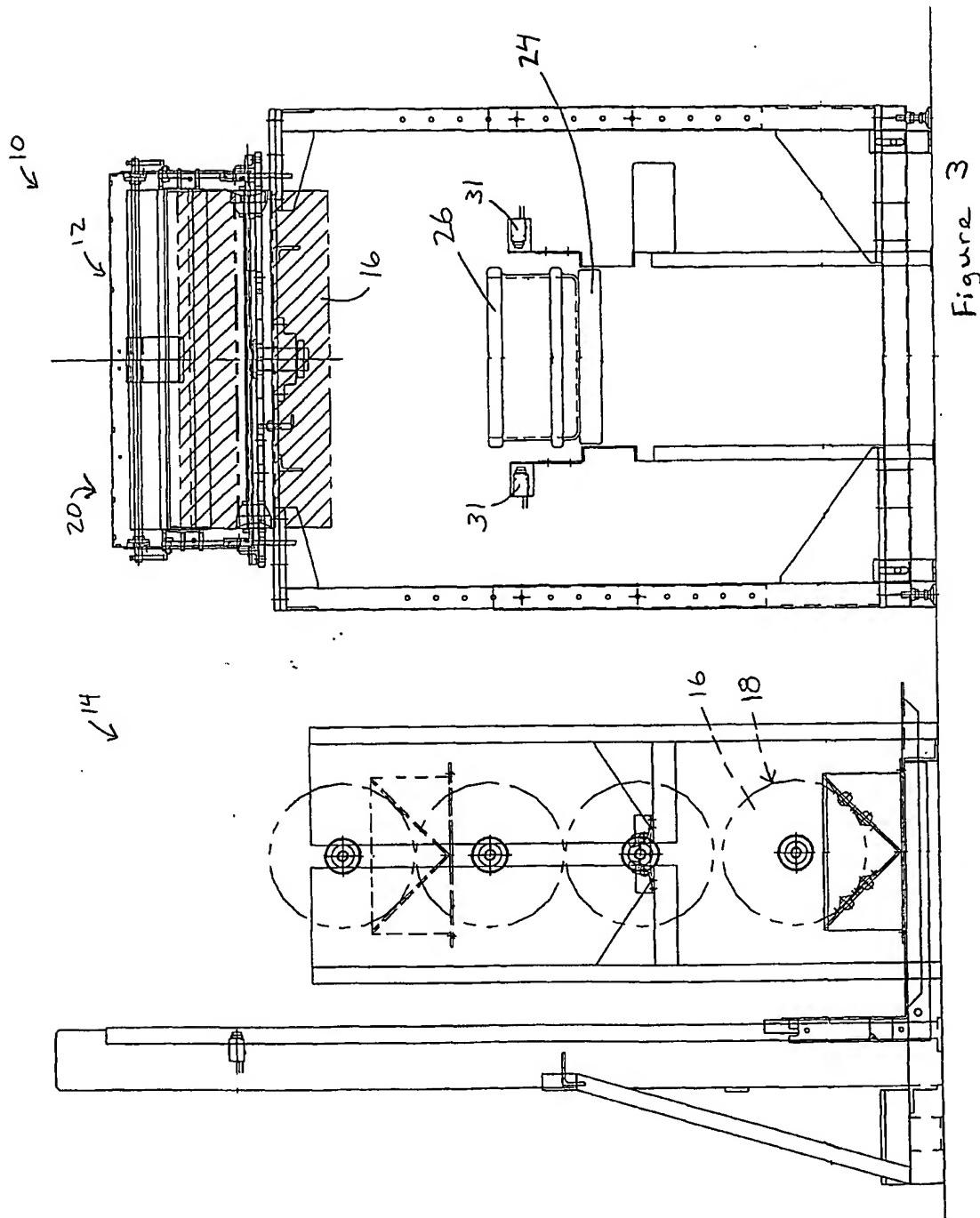


Figure 2



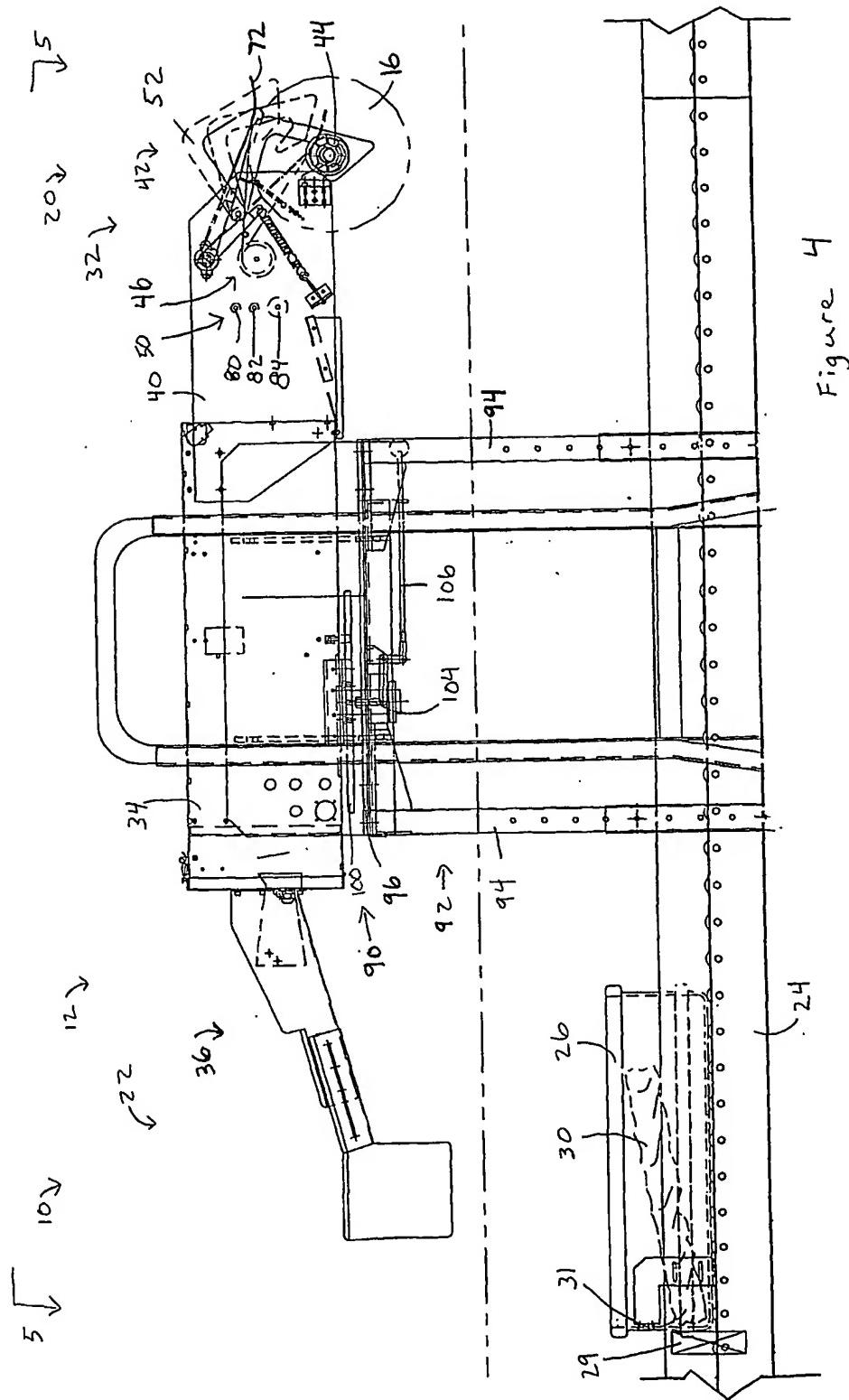


Figure 4

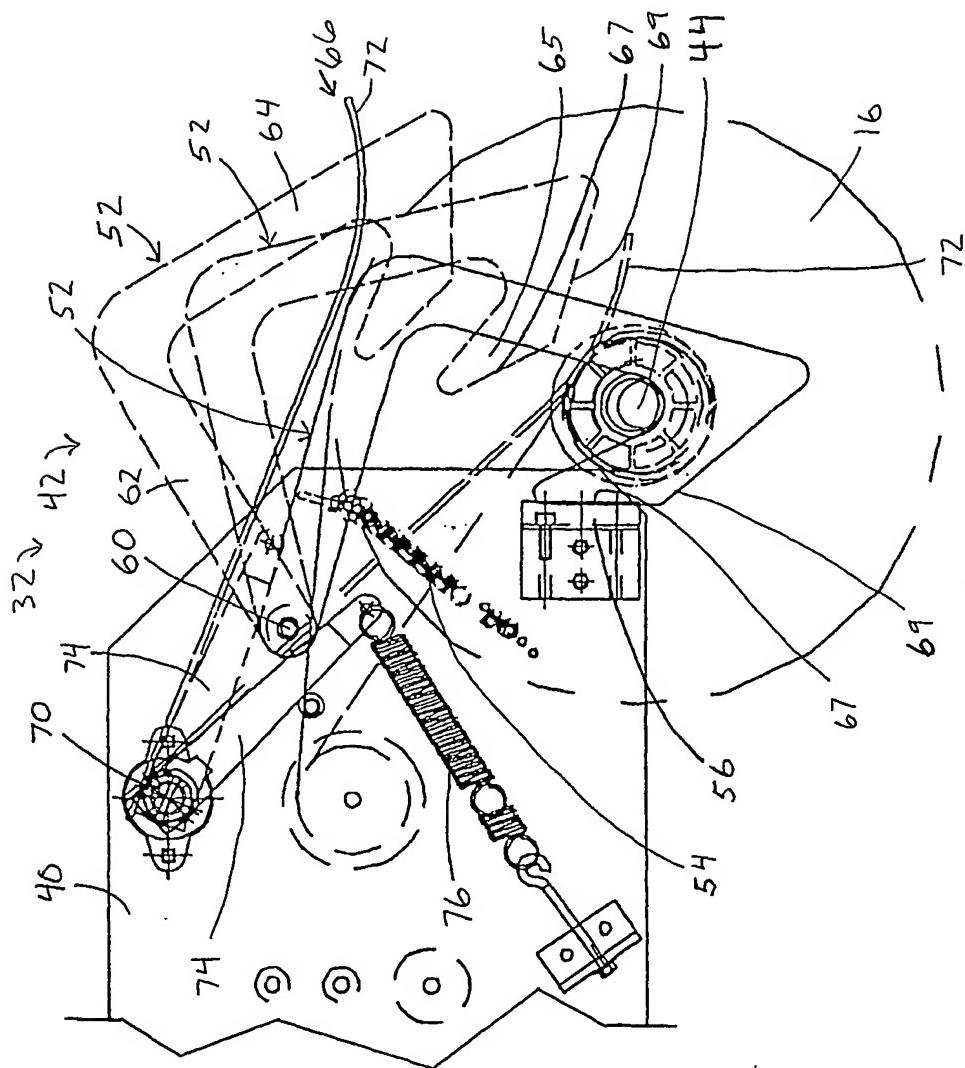


Figure 4A

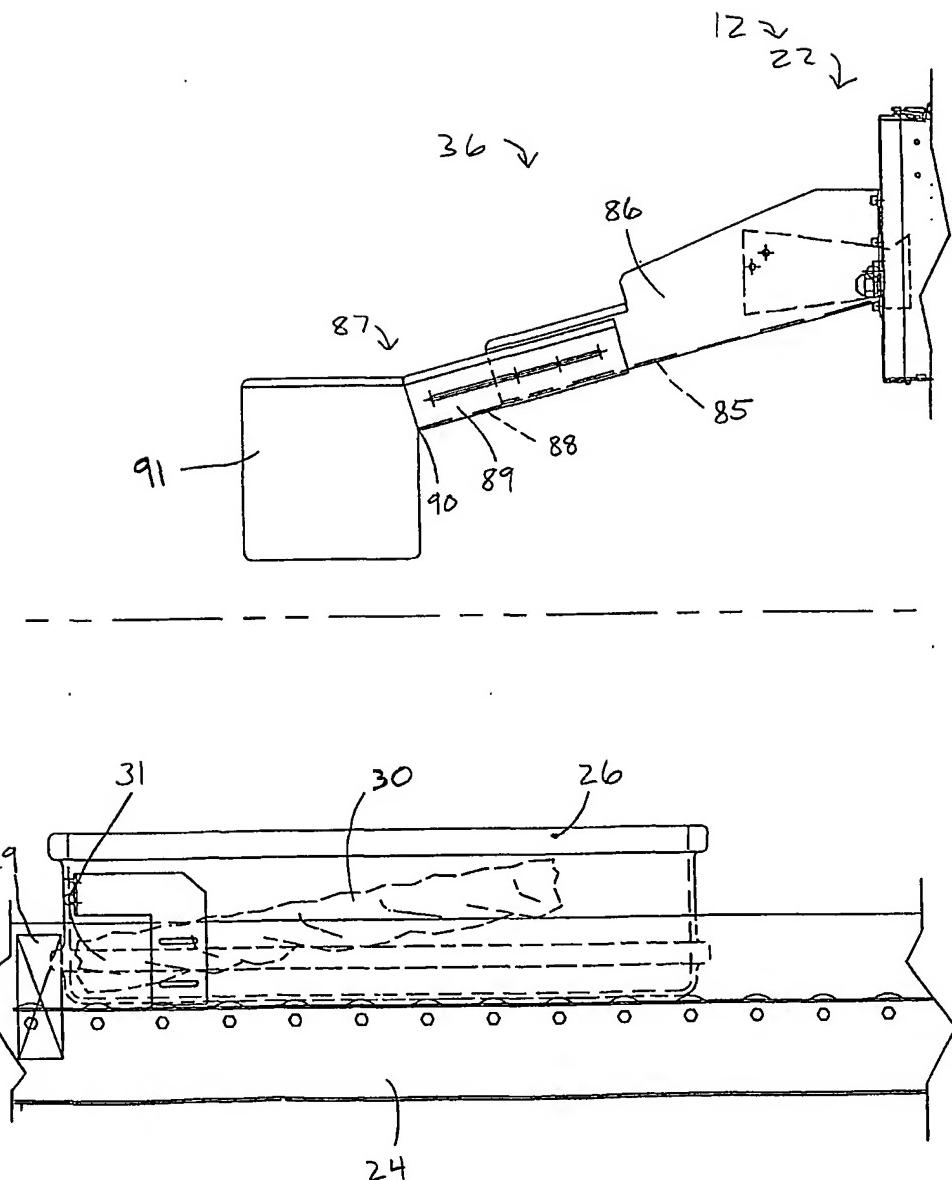


Figure 4B

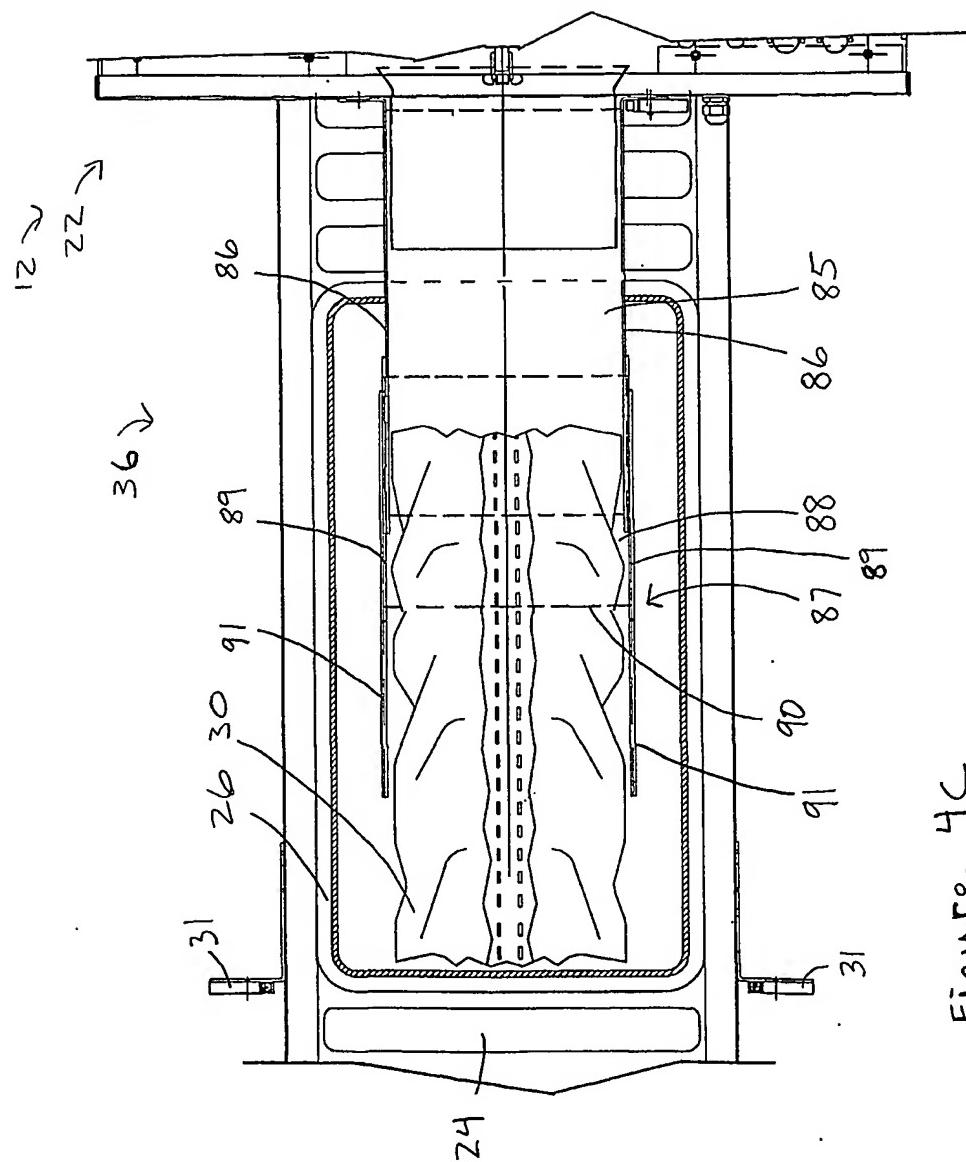


Figure 4C

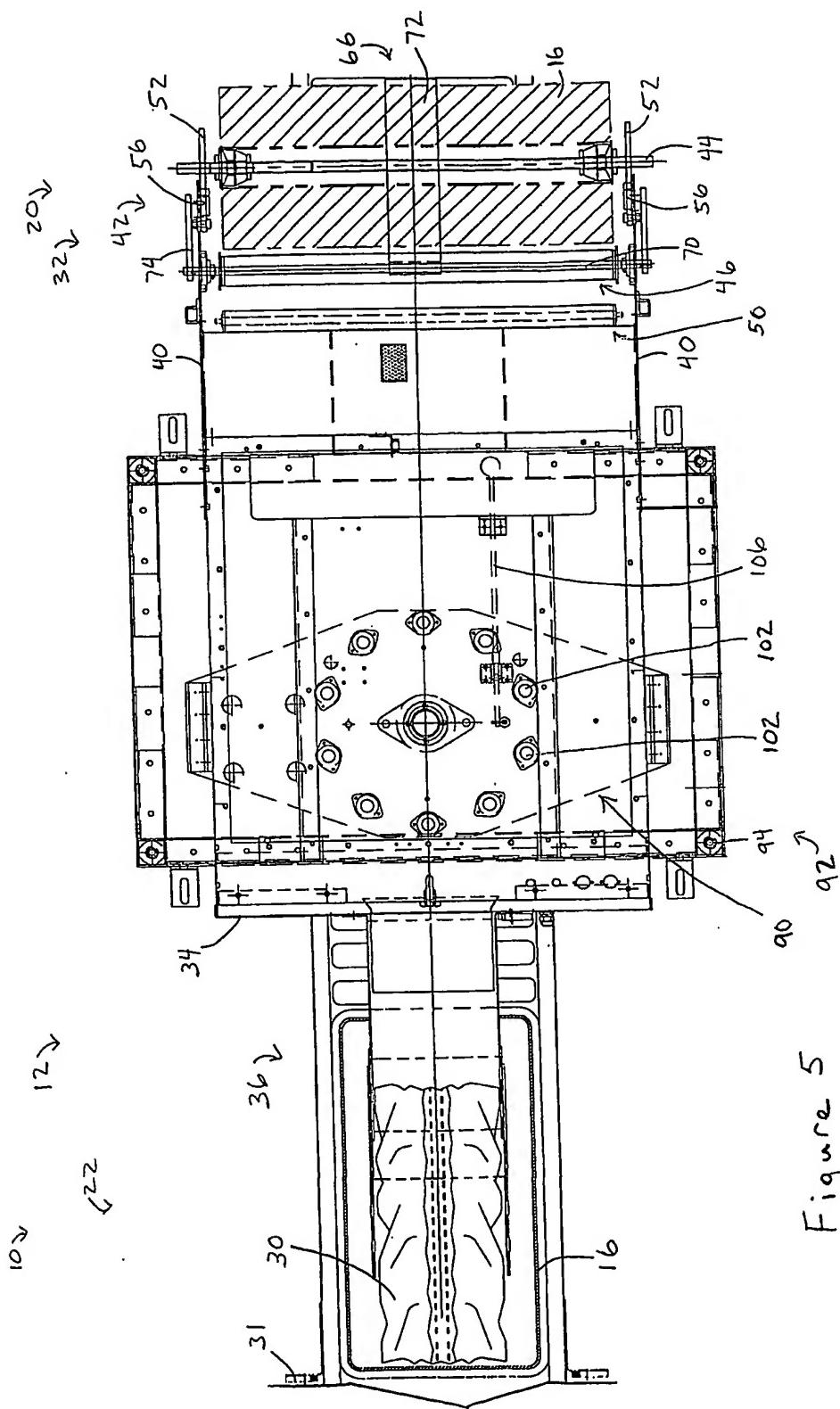
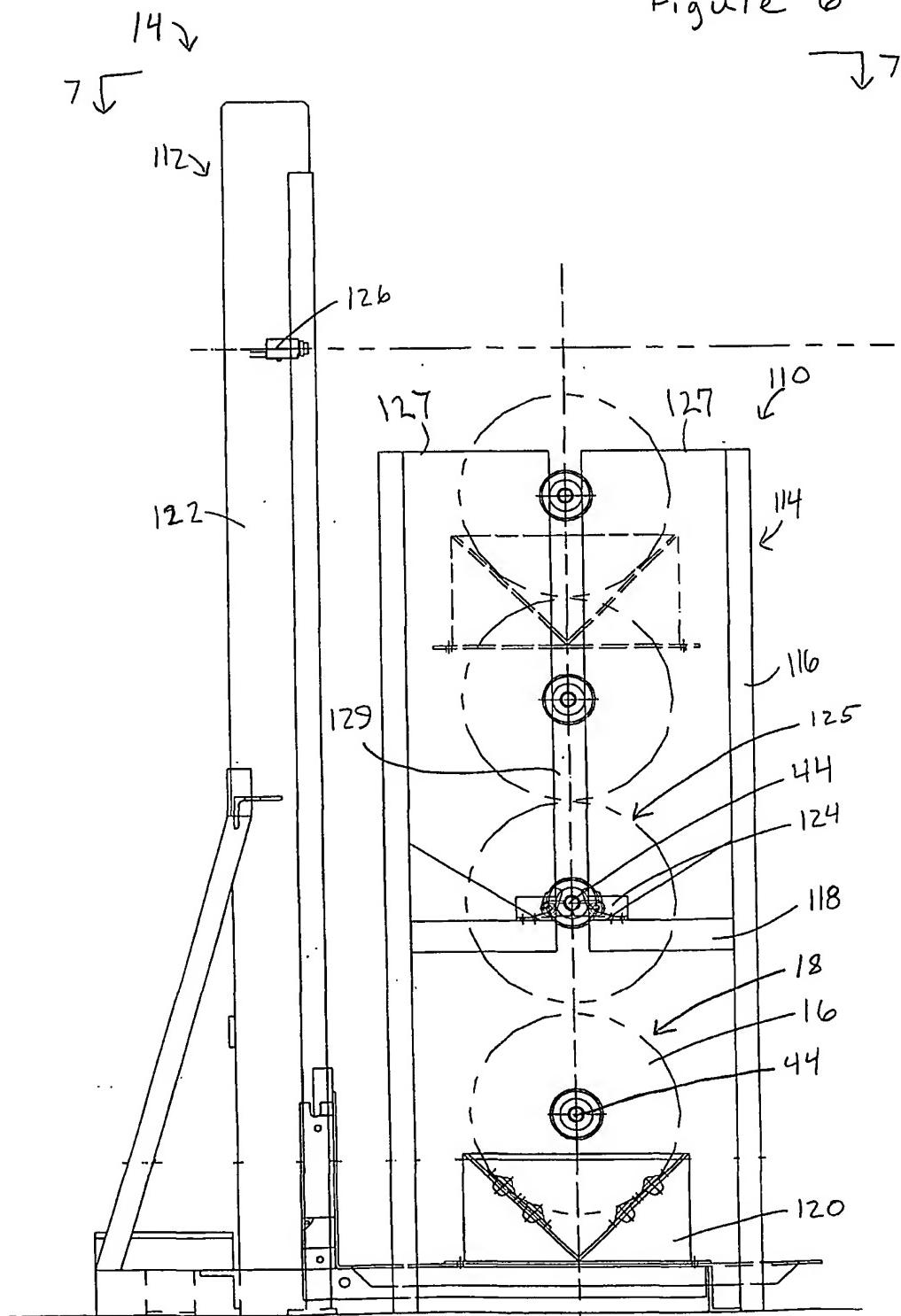


Figure 5

Figure 6



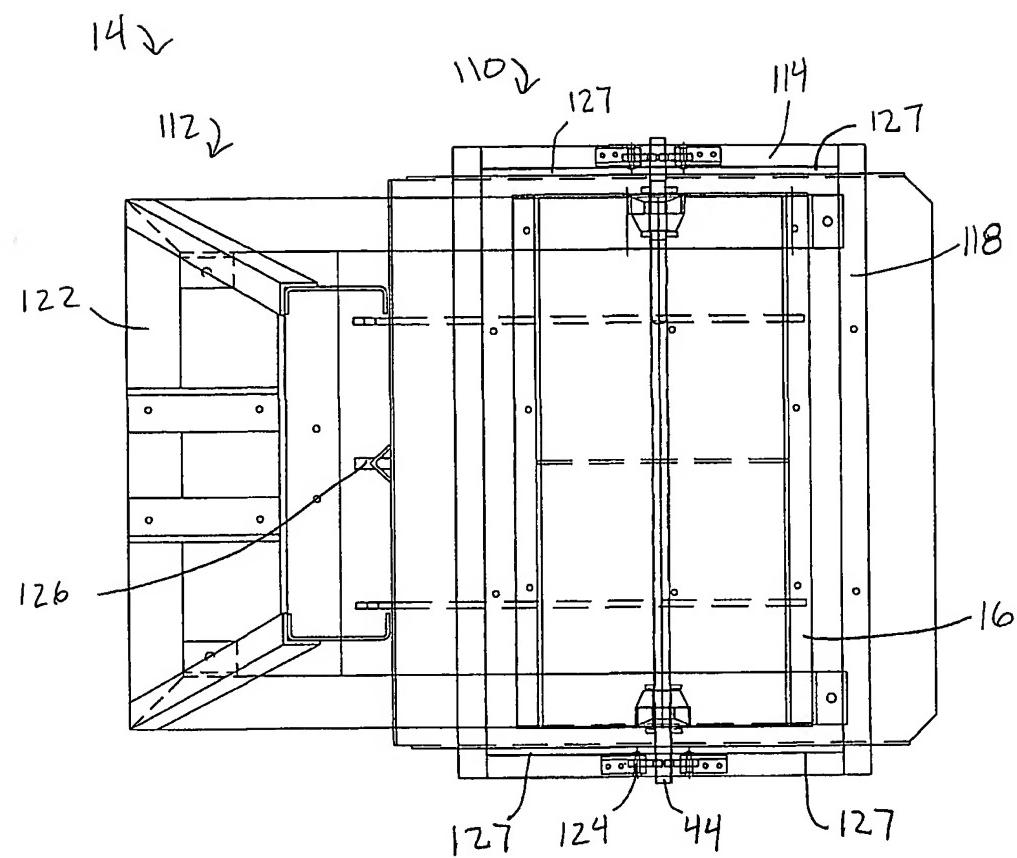


Figure 7

